Detection of a geostationary satellite with the Navy Prototype Optical Interferometer

J.T. Armstrong[*a], R.B. Hindsley[a], H.R. Schmitt[b], F.J. Vrba[c], J.A. Benson[c], D.J. Hutter[c], R.T. Zavala[c]
[a] Naval Research Laboratory, Code 7215, 4555 Overlook Ave. SW, Washington, DC 20375, USA;
[b] Interferometrics Inc., 13454 Sunrise Valley Drive, Suite 240, Herndon, VA 20171, USA;
[c] US Naval Observatory, Flagstaff Station, 10391 W. Observatory Rd, Flagstaff, AZ 86001, USA

ABSTRACT

We have detected a satellite via optical interferometry for the first time, using a 16 m baseline of the Navy Prototype Optical Interferometer (NPOI) to observe the geostationary communications satellite DirecTV-9S during the "glint" seasons of February-March 2008 and 2009 when the sun-satellite-NPOI geometry was favorable for causing specular reflections from geosats. We used the USNO Flagstaff Station 40-inch telescope to generate accurate positions for steering the NPOI. Stars are the easiest targets for optical/infrared interferometers because of their high surface brightness. Low surface brightness targets are more difficult: if they are small enough not to be resolved out by typical baselines, they are likely to be too faint to produce detectable fringes in an atmospheric coherence time. The 16 m NPOI baseline, the shortest available at the time of our observations, resolves out structures larger than ~1.5 m at the distance of a geosat, while a typical size for the solar panel arrays is 2 m x 30 m. Our detection indicates that a small fraction of the satellite glinted, not surprising given that the solar panels are not accurately flat. It is also consistent with the brightness of the glints: a glint of magnitude ~2 from a satellite of albedo ~0.1 would be produced by a 4 m^2 area. Our fringe data are consistent with a two-component image consisting of a ~1 m high(er) surface brightness component and a ~3 m lower surface brightness component.

Keywords: optical interferometry, NPOI, satellites

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[*] tom.armstrong@nrl.navy.mil. Phone: 202-767-0669